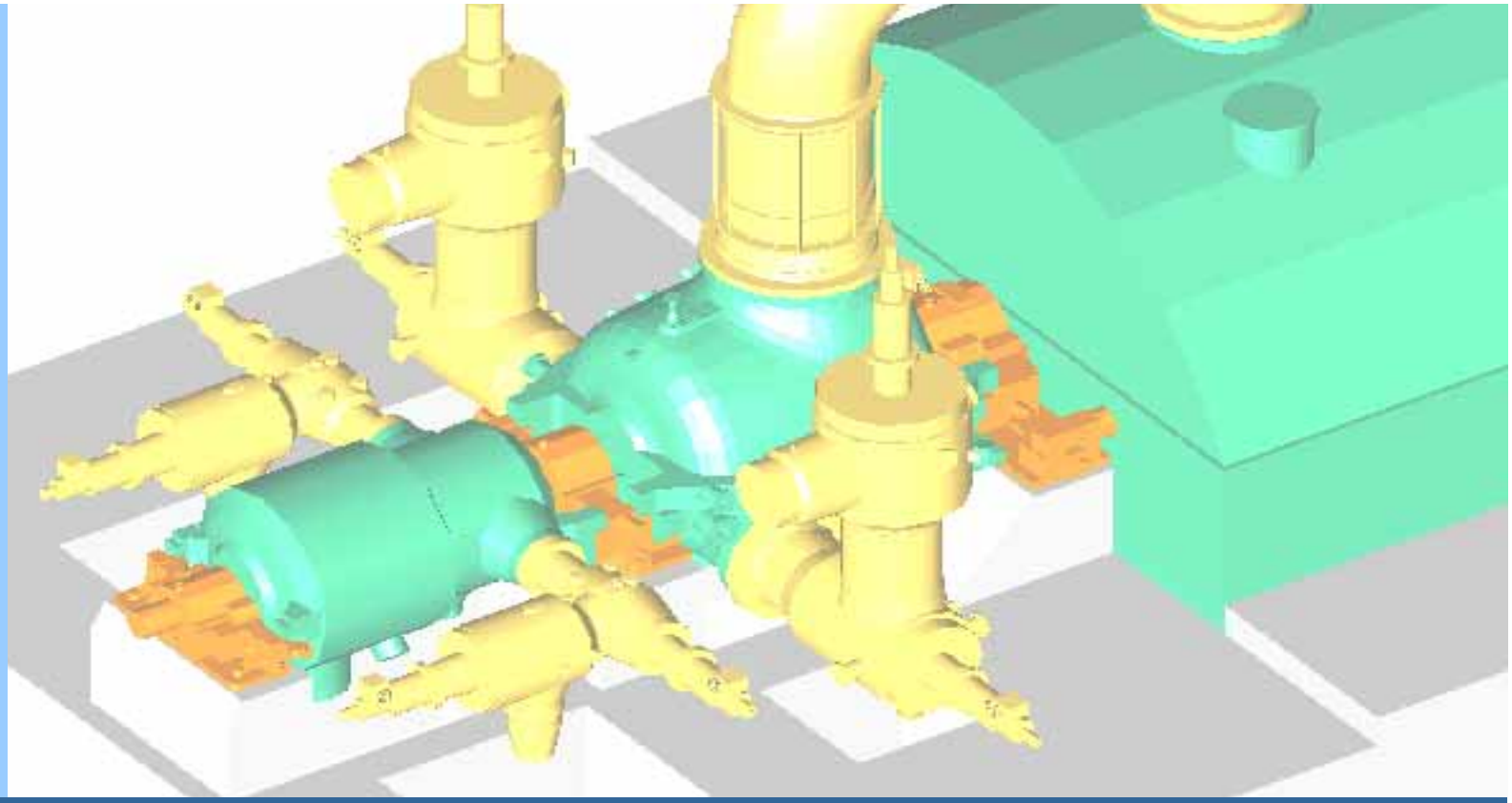

Siemens Steam Turbine Design for AD700 Power Plants
(AD700 financed activities)

SIEMENS

Kai Wieghardt

2005-10-27

Contents

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700°C/720°C Turboset (400 MW Single RH)
Water Steam Cycle and Turbine Arrangement

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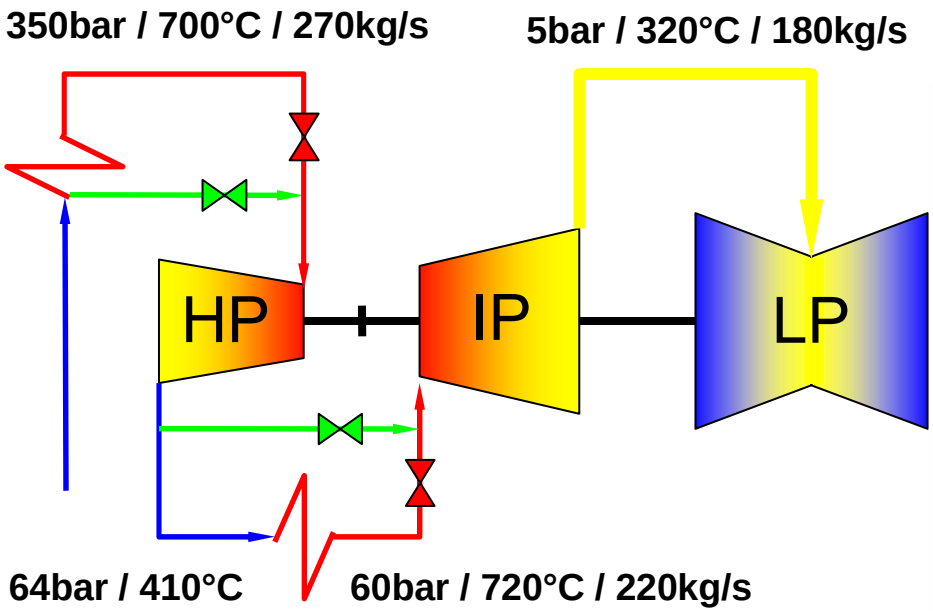

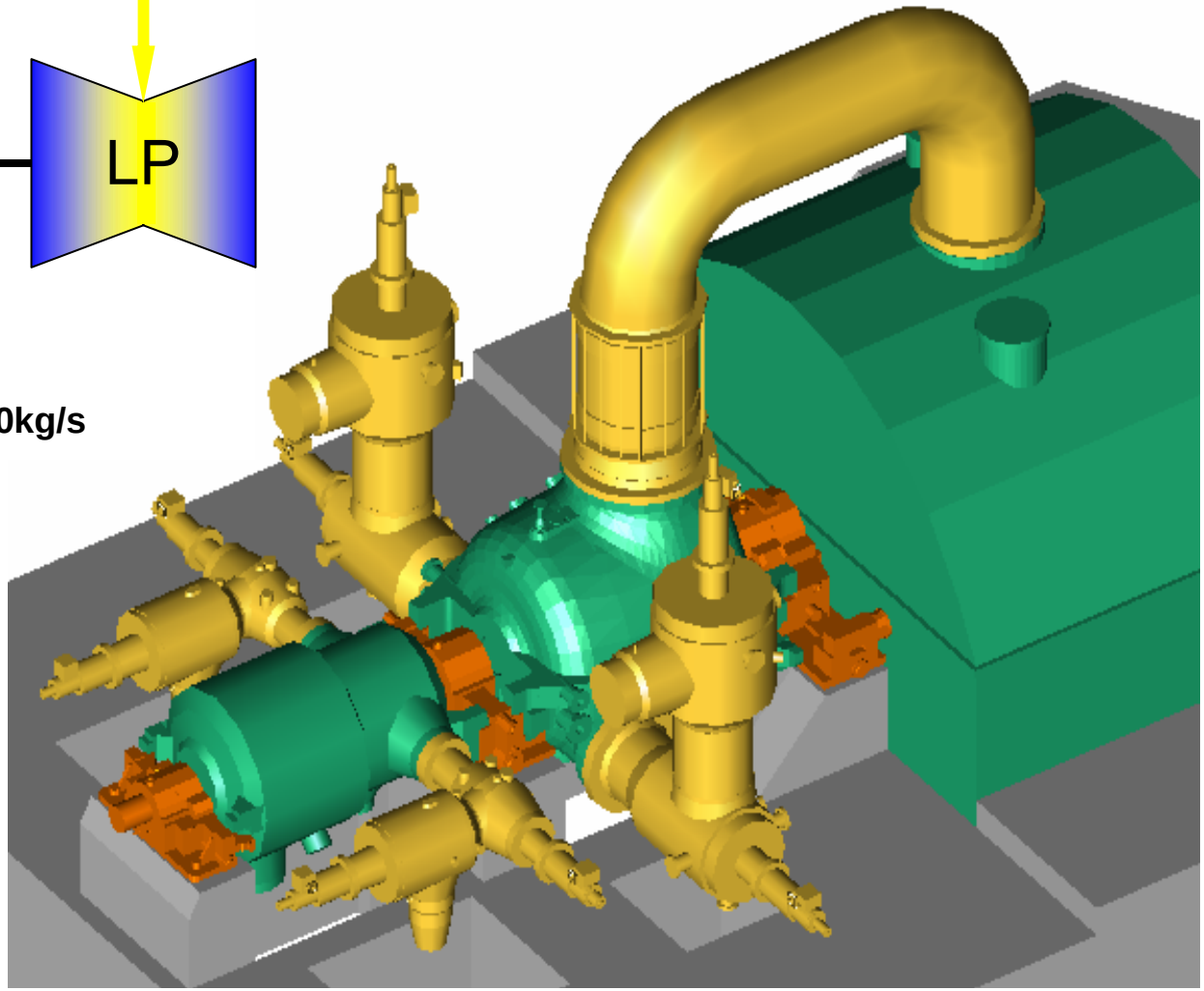

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AD700 Siemens

Steam Cycles 600°C/620°C vs. 700°C/720°C
IP Turbine

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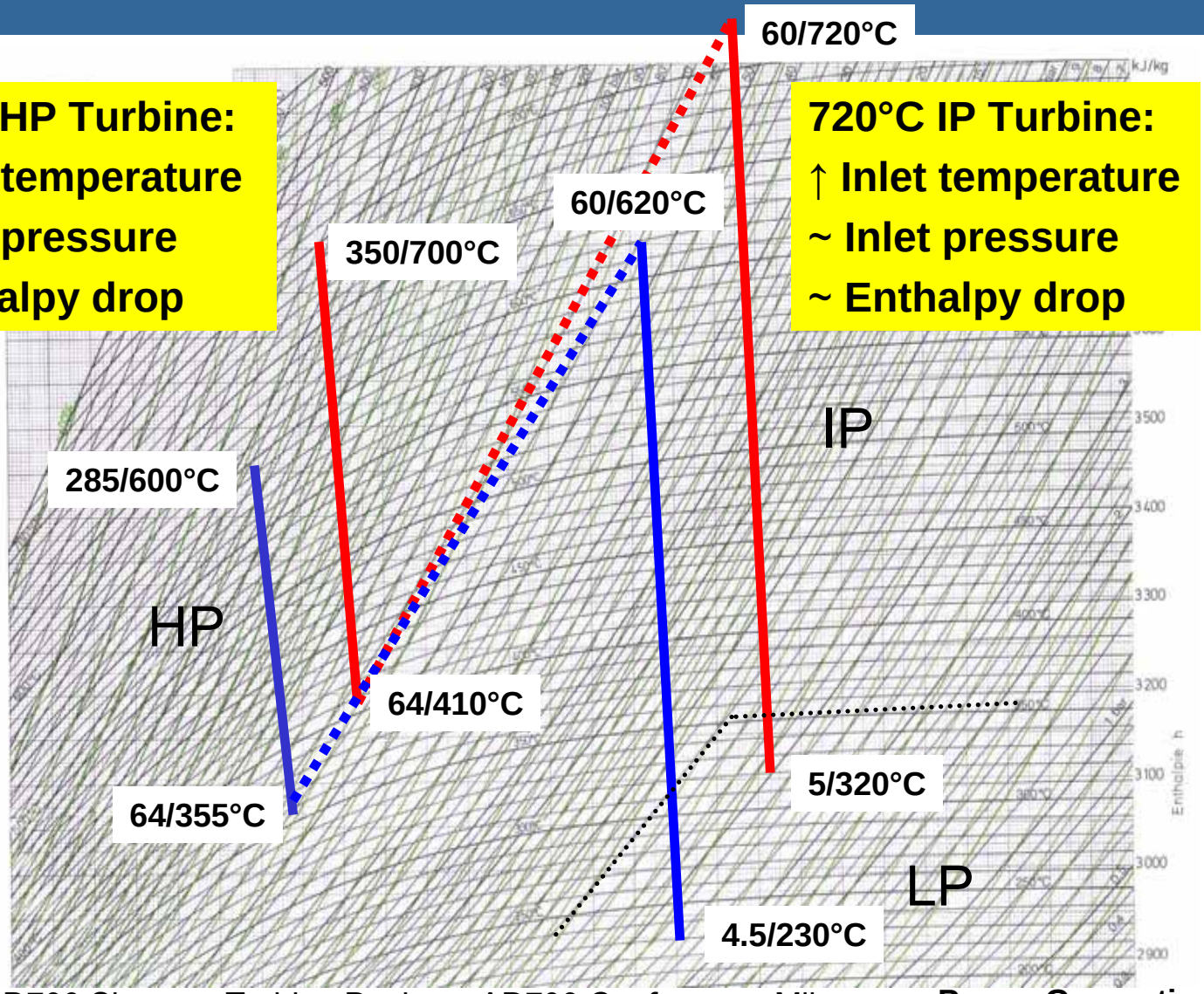
700°C HP Turbine:
↑ Inlet temperature
↑ Inlet pressure
↑ Enthalpy drop

720°C IP Turbine:
↑ Inlet temperature
~ Inlet pressure
~ Enthalpy drop



Steam Cycles 600°C/620°C vs. 700°C/720°C
Conclusions for HP Turbine Design

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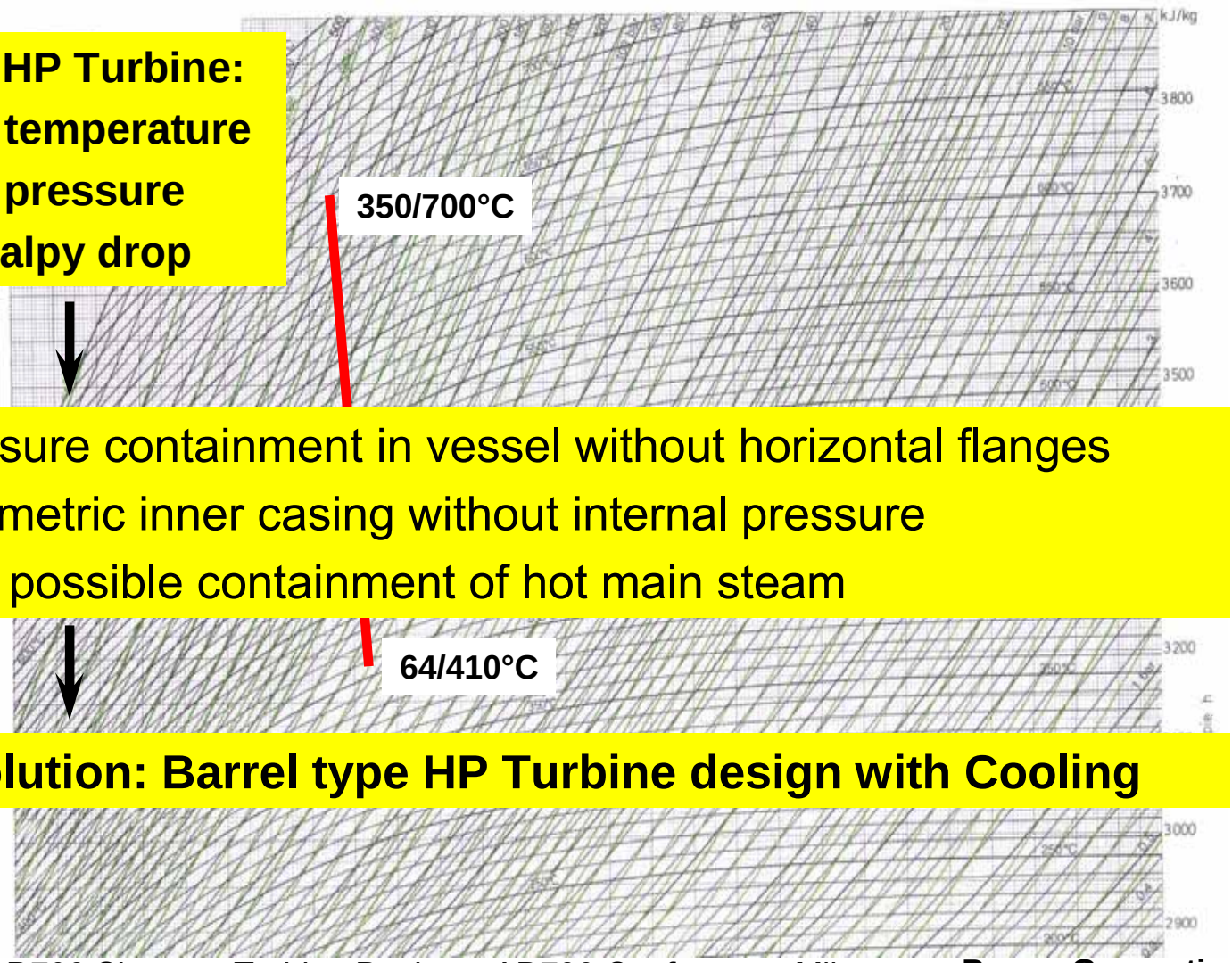
700°C HP Turbine:
↑ Inlet temperature
↑ Inlet pressure
↑ Enthalpy drop



- Pressure containment in vessel without horizontal flanges
- Symmetric inner casing without internal pressure
- Best possible containment of hot main steam

Solution: Barrel type HP Turbine design with Cooling

700°C HP Turbine
Longitudinal Section with External Cooling

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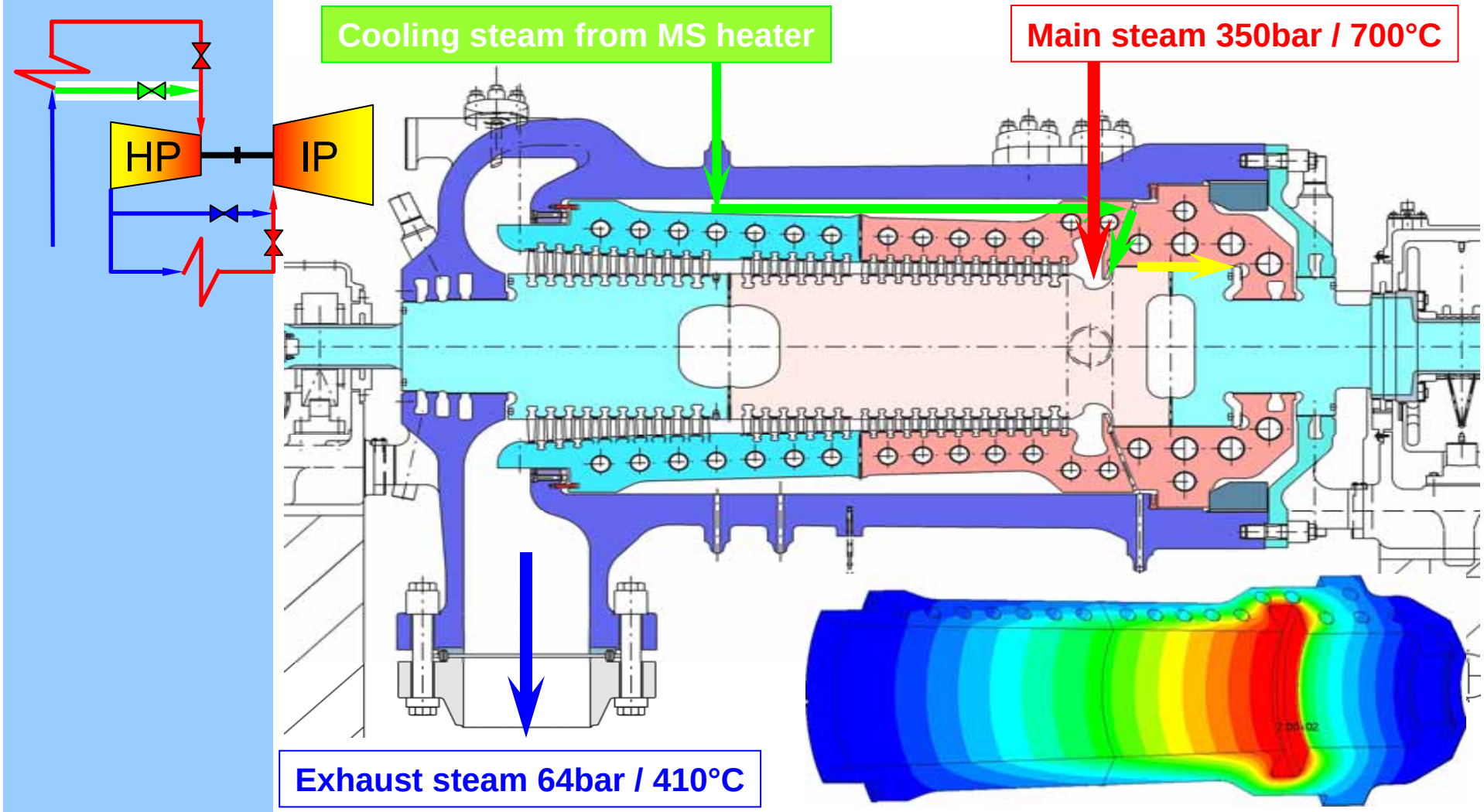

Steam Cycles 600°C/620°C vs. 700°C/720°C
Conclusions for IP Turbine Design

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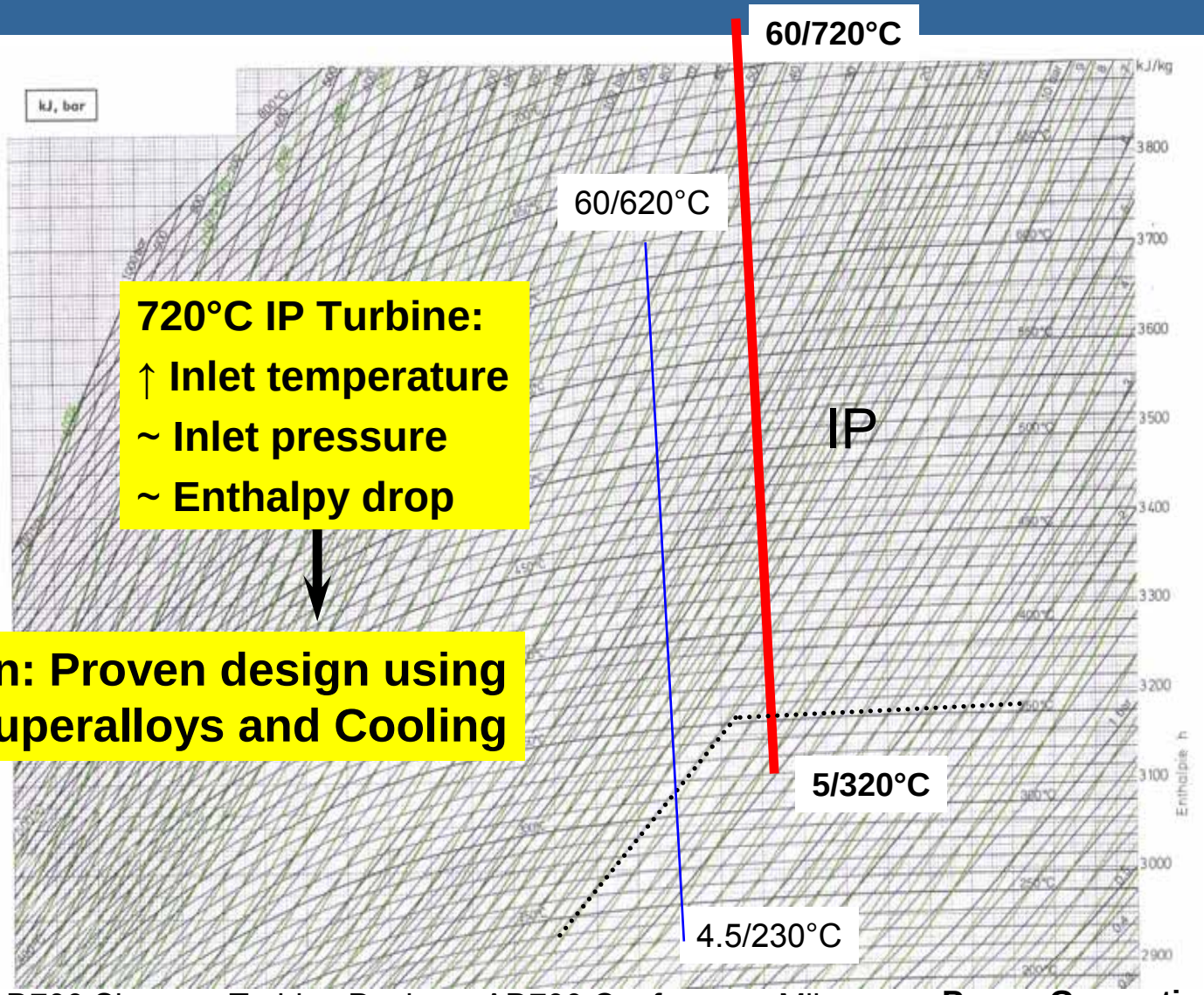

720°C IP Turbine:
↑ Inlet temperature
~ Inlet pressure
~ Enthalpy drop

Solution: Proven design using Superalloys and Cooling

720°C IP Turbine
Longitudinal Section with External Cooling

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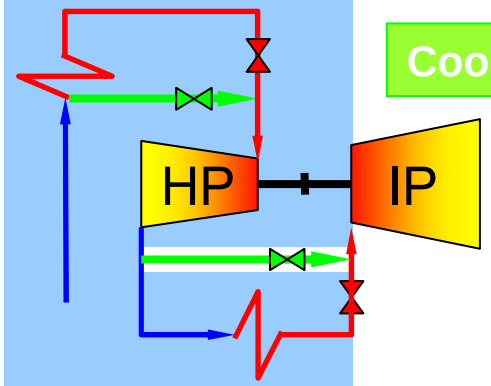

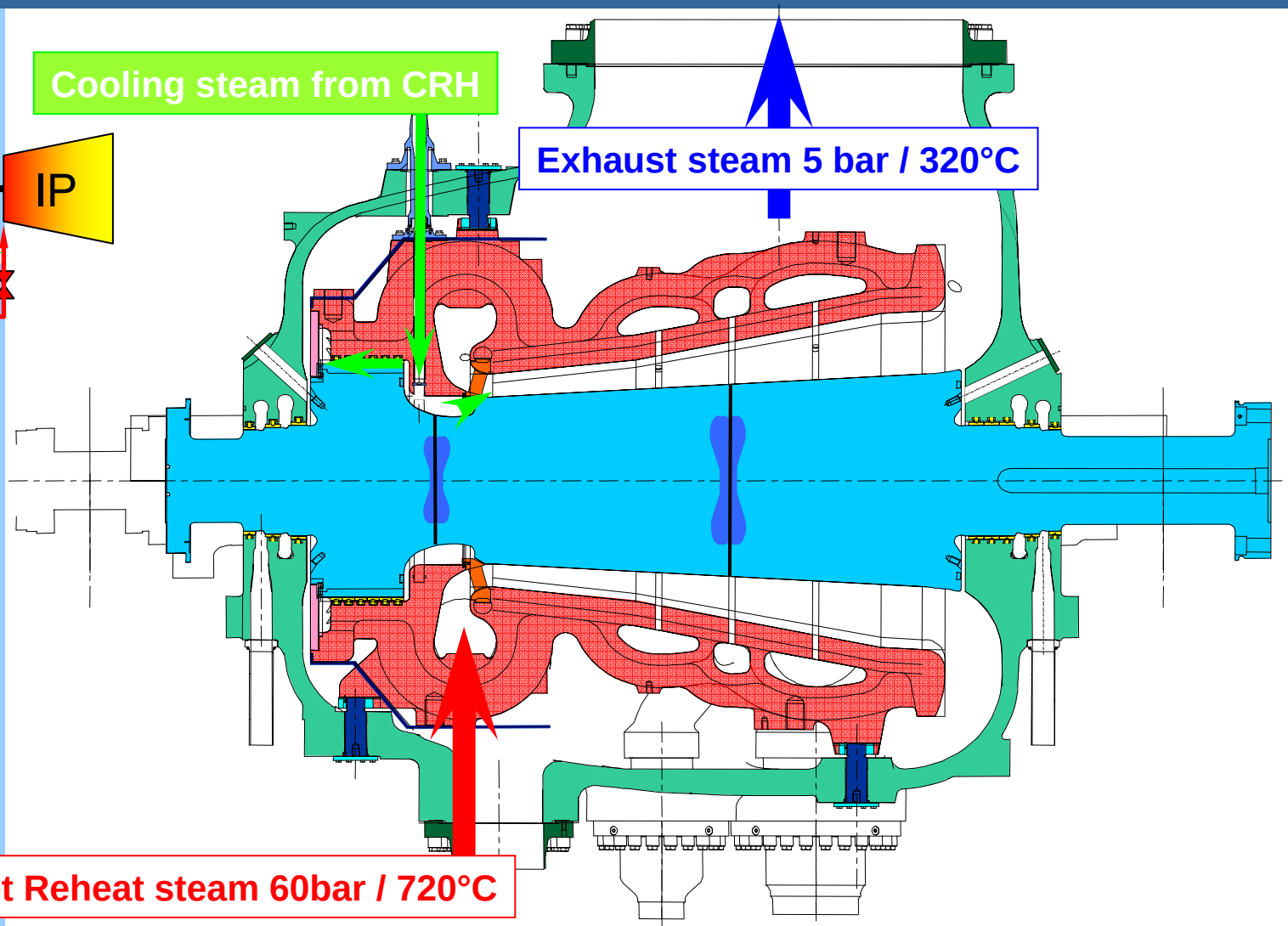

720°C IP Turbine
Welded Rotor Design

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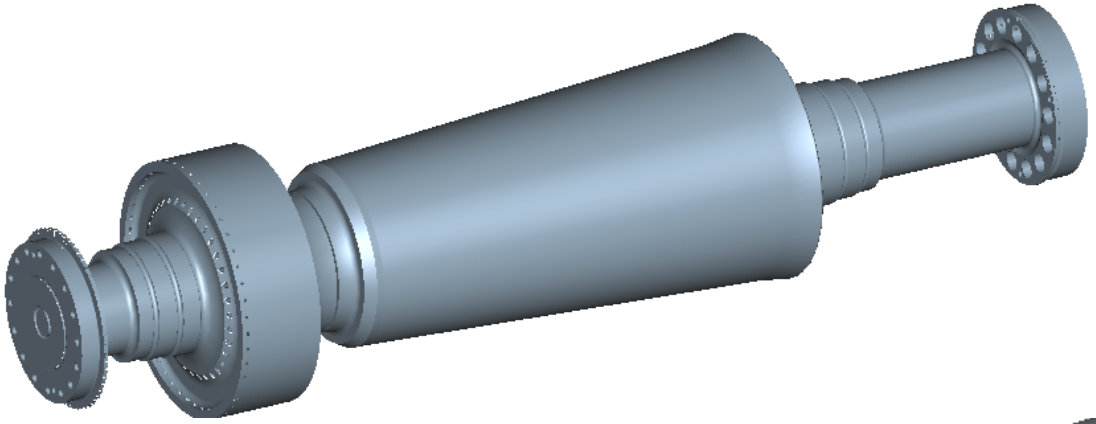

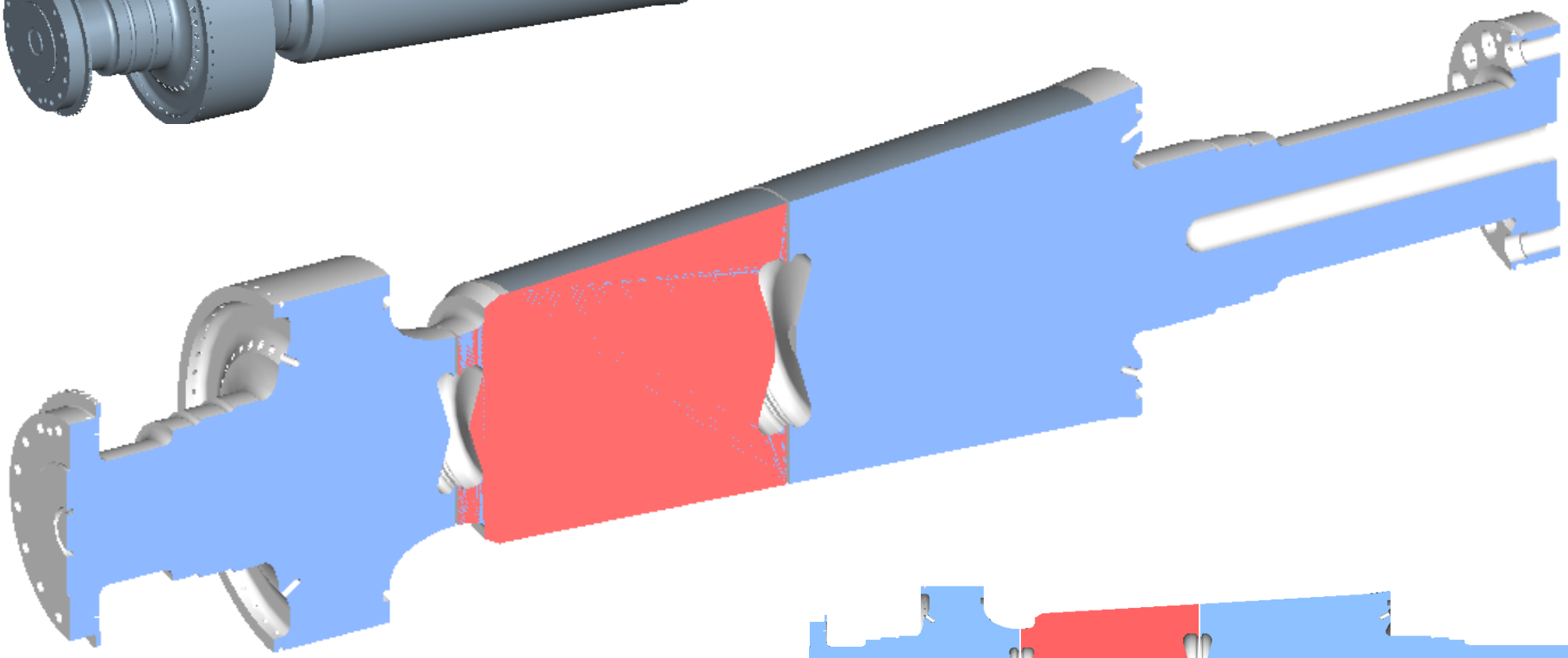

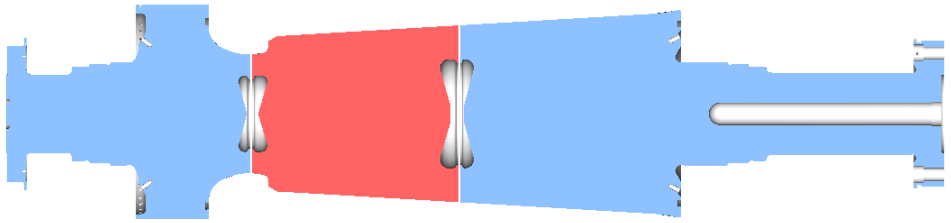

Test of a critical 700°C Turbine Component: **COMTES700 Turbine Valve**

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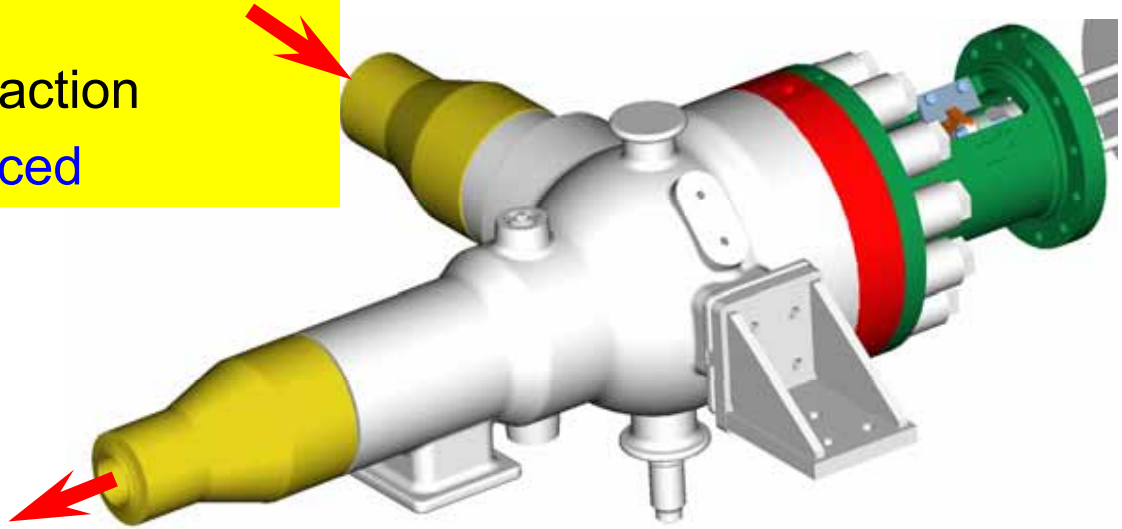
COMTES700 Turbine Valve Test

- Test Phase 2005 – 2009
- Full-scale component (4000kg) exposed to 210 bar / 705°C
- Main objectives:
  - Sliding & contact surfaces
  - Creep & LCF
  - Volumetric contraction
- 100% privately financed



COMTES700 Turbine Valve
Erected Valve with Actuator

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Summary

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- **Siemens AD700 Turboset for 350bar/700°C/720°C has a classical HP-IP-LP arrangement**
- **HP turbine with proven barrel type design by using an innovative external cooling concept**
- **IP turbine with proven design and external CRH cooling**
- **Main steam and reheat valves with proven design**
- **Further 700°C development steps are necessary including lessons learned from COMTES700 (design optimisation, materials testing, design philosophy)**
- **Siemens is engaged for this with large private investment.**